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Betel-Nut Palm Care

GUAM COOPERATIVE EXTENSION

FRUIT PRODUCTION PUBLICATION

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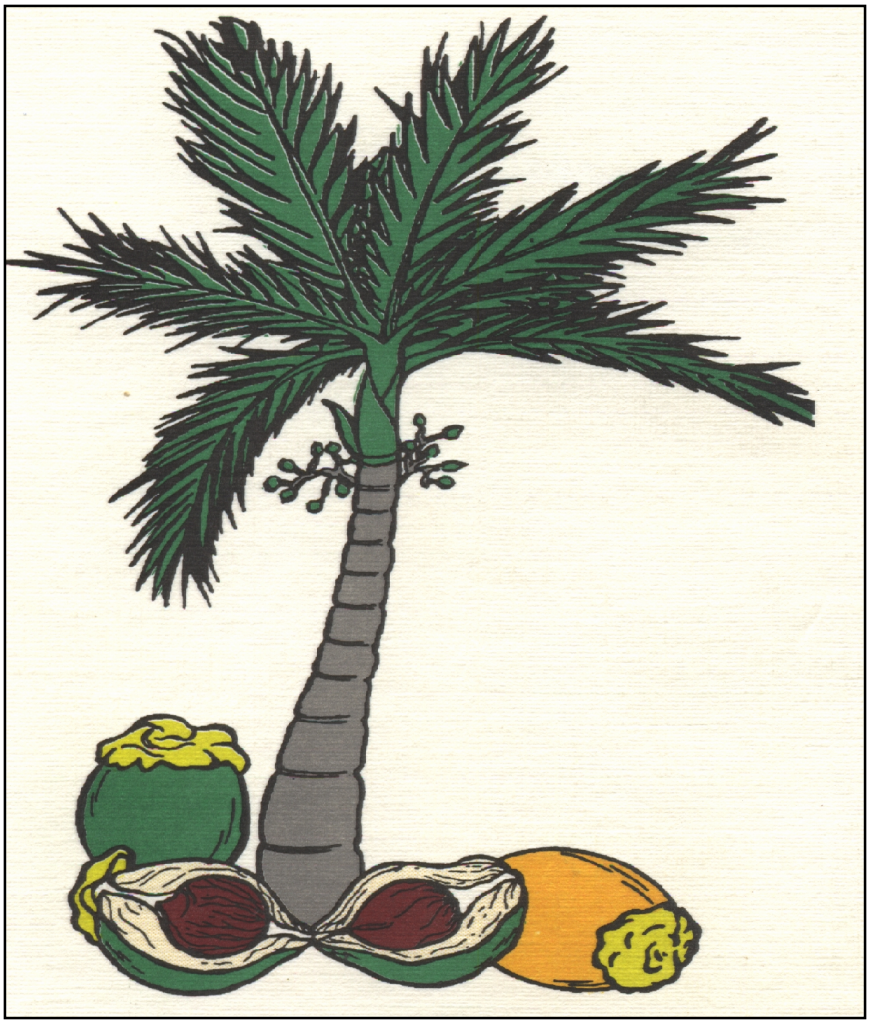


Foreward

This publication is intended to provide readers with general information on the care of the betel-nut palm, *Areca catechu.* The information includes sections on varieties, propagation methods, fertilizer and fertilizer use, fruit production, harvesting, and pest problems. The sections on propagation, harvesting and pest problems in this publication are based principally on the writers' experiences in growing betel-nuts on Guam.

Introduction

A member of the Palm family, the BETEL-NUT or ARECA-NUT, known scientifically as ***Areca catechu***, is a relative of the coconut (***Cocos nucifera***). Betel-nut palms thrive in tropical and subtropical areas and are less tolerant of cooler climatic conditions than may be exhibited by other palms. The betel-nut palm is widely cultivated in India, Bangladesh, Sri Lanka, Indonesia and on numerous islands in the Western Pacific.

The origin of the common name ARECA-NUT can be traced back to the scientific name of ***Areca catechu***. The origin of the common name BETEL-NUT comes from the association of chewing the nut along with the mint-tasting leaf of the ***Piper betle***, commonly known as betle (or betel) leaf.

The term *betel-nut* (or *areca-nut*) refers to either the plant (palm) or the nuts produced by the palm. On the other hand, the term *betel-nut palm* (or *areca-nut palm*) is used to refer to the plant.

In the Marianas, the Chamorro word for betel-nut is "pugua" (pu-gwa'). It is believed that the betel-nut was introduced on Guam by the first inhabitants and has since become naturalized, growing in dense jungle where soil moisture retention is high. Because of its popularity among the local residents as a chewing habit (akin to chewing tobacco), the betel-nut is now commonly cultivated around farms and homes.

Another popularly cultivated palm that produces a similar nut is the Chinese betel-nut (*Veitchia merrillii*). The Chinese betel-nut, or "pugua chena" (poo gwa' chee na) in Chamorro, is principally grown for ornamental reasons. However, in times of *Areca catechu* scarcity, some "pugua" consumers are known to use the Chinese betel-nut as a substitute.

Note: The proceeding discussion on betel-nut pertains to that of *Areca catechu.*

Varieties & Betel-Nut Consumption

All betel-nut palms are similar in their morphology (physical structure). However, while one betel-nut palm may look identical to another betel-nut palm, some distinguishable differences can be seen in the nuts they produce. These differences in the nuts produced may include any one or all of the following: size, shape, color of husk and kernel (flesh) color. But to the betel-nut consumer, the nut's size, shape and color of husk is of little importance. The single most important feature of the betel-nut is the color of the nut's kernel. To the betel-nut consumer, the color of the kernel is important as it distinguishes varieties.

Red and White Varieties - The avid betel-nut consumer is familiar with two major varieties which they refer to as "Red" and "White" varieties. The "Red" variety can range from red to deep purple in kernel color. The "White" variety can have kernels that range from off-white to a deep tan color. In the Marianas, the "Red" variety is call "ugam" (oo-gam) and the "White" variety is known as "changnga" (chang-nga). Once in production, a betel-nut palm will consistently produce either all "Red" or "White" kernel nuts.

Betel-nut Consumers - Basically, there are two types of betel-nut consumers: those that prefer to chew the "White" variety and those that will opt for the "Red" variety. Those who chew the "White" variety generally prefer the nut at a soft, young or immature stage, while

those who chew the "Red" variety generally prefer the nut at a hard and mature stage.

Betel-nut and Additives - Some betel-nut consumers are known to use the mint-tasting betel leaf, lime and/or tobacco in association with betel-nut chewing. As noted earlier, the betle leaf comes from the vine of the *Piper betle*. Lime was once commonly made by the Chamorro people by cooking a stockpile of limestone rocks in an outdoor fire pit. Today, most of the lime used comes from commercially manufactured sources. The tobacco used is generally the chewing form. However, some betel-nut consumers are known to use tobacco off a cigarette. The betle leaf, lime and tobacco are known in Chamorro as "pupulu" (poo-pu-lu), "afuk" (a-fook), and "amaska" (a-mas-ka) respectively.

Use of Additives - The betle leaf, lime and chewing tobacco are common additives for both hard- and soft-nut consumers. The frequency and combination of the use of the additives vary from consumer to consumer. More recently though, the majority of hard-nut consumers will use the betle leaf as an additive or chew the nut alone. The use of the betle leaf, lime and tobacco, in varying combinations, is still very common among soft-nut consumers.

Betel-nut Chewing and Ethnicity, Yesterday and Today - In Micronesia, the consumers of the hard nuts are primarily those of Chamorro descent, and the consumers of soft, immature nuts were primarily those of Western Carolinian and Palauan descent. However, a cross section of Micronesians as well as newly established residents can be seen today chewing either soft or hard nuts. Today, it is not unusual to find an avid betel-nut consumer switching from soft to hard nuts and vice-versa, again depending on availability of supply.

Propagation

Propagation is the means through which plants are reproduced. The most common method of reproducing the betel-nut is seed propagation.

Seed Selection and Germination - Mature fruits (nuts) of a desired variety, "Red" or "White," are used as seed source. However, because the betel-nut is known to be wind-pollinated, there is no guarantee that a seed from a desired variety will grow to bear the same variety due to the effects of cross-pollination. Unfortunately, cross-pollination cannot be detected until the planting material (seed) becomes mature and produces its own nuts. (Refer to the section on Flower and Fruit Production for more discussion on cross-pollination.)

To ensure a greater chance of germination, a mature nut must be used as a seed source. The nut is considered mature when the flesh is hard. Avoid the use of dried kernel nuts as this may lessen the possibility of successful germination. Generally, a nut will have reached maturity when the husk has completely turned from green to yellow or orange. A freshly harvested mature betel-nut may take as long as three (3) months to germinate.

Direct Seeding vs. Transplanting - Once selected, seeds may be sown directly at a desired location to germinate and to grow to maturity. However, the practice of direct seeding, especially with multiple plantings, can be (1) time consuming, and (2) more prone to physical damage during their early growth stages. Direct seeding requires more time as each planted site is visited for watering and weeding. Also, greater chances for physical damage can be brought about by accidental cutting due to yard or field maintenance, trampling by people, and diggings by pets and other animals.

In general, starting out plants as seedlings for transplanting is a more efficient way of propagating betel-nuts. Seedlings grown in a plant nursery-like environment allows for easier watering, weeding and general maintenance. In addition, transplanted hardy seedlings have a greater chance of survival than those directly seeded.

Seedling Preparation and Maintenance - If a large number of plants are to be grown, it is best to germinate selected nuts in a shallow tray or other tray-like

container (about 2 inches deep) with adequate drainage. Place nuts in a single layer in the tray and cover with soil or other adequate growing medium. To avoid soil-borne diseases, the use of a sterile growing medium is advisable. Next, place the tray where it can receive adequate sunlight (morning sunlight is best). Be sure to maintain adequate moisture in the growing medium to prevent seedlings from drying, but avoid flooding conditions. Once germinated, each seedling should be removed from the tray and transferred into at least a one-gallon size soil-filled container with adequate drainage. Caution: Germinated seedlings left too long in the tray will become prone to root damage when removing. It is also possible to germinate seeds (nuts) in individual containers.

With proper care, betel-nut seedlings kept in one-gallon size containers can be hardened and ready for transplanting four (4) months from germination. Note that the roots of seedlings may become entangled (root-bound) when kept too long in containers. Root-bound seedlings generally take longer to recover once planted in the ground. If seedlings in containers are intended to be kept longer than 4 months, the following recommended container sizes may be used as a guide: a three-gallon (3) size container for seedlings kept 6-8 months, and a five-gallon (5) size container for seedlings kept up to 12 months. Be sure all containers have adequate drainage.

Regular watering and exposure to partial shade or filtered sunlight are of extreme importance to seedling care, especially during the first 4 months of growth. When seedlings are kept in larger containers, extreme care must be taken not to over water because it can contribute to root rot.

Site Selection - Select a site with adequate sunlight. A preferred location will be one where full afternoon sunlight is abundant. But, above all, select a site that exposes the palm to at least 4 full hours of sunlight. Betel-nut palms lacking adequate sunlight tend to grow tall before beginning to produce fruits. Also, be sure that irrigation water is available during the dry season. Betel-nut plants require lots of water. Avoid planting betel-nut palms in heavy clay soil because such soil-type does not provide adequate water drainage.

Transplanting - For easier removal of seedlings from a container, and to lessen root damage, saturate the soil in the container with water. Loosen the medium (soil) by working a spade where the soil and the inner part of the container meet, and by rolling the container on its side several times on a hard surface. Next, while holding the seedling from its base (nearest to the soil), turn the container upside down, rest the top edge of the container against a hard surface, and gently pull out the seedling. With older seedlings in metal containers, the roots may become attached to the rusted body of the containers during growth. In this case, it may be necessary to prune or remove excess roots.

The planting hole where the seedling is to be transplanted should be large enough to fit the entire volume of the seedling's growing medium and root system plus fertilizer and additional soil. Before placing the seedling in the planting hole, it is advisable that 1/4 lb. of granular form complete fertilizer be placed at the bottom of the hole. (Refer to the section on Fertilizer for more information.) Cover the fertilizer with at least 8 inches of soil before placing the seedling into the planting hole. It is important that the fertilizer in the planting hole does not come in immediate contact with the roots of the seedling as it may result in plant injury. Fertilizers, if not used properly, may burn plants. Again, ensure that the planting hole is deep enough to accommodate (1) the fertilizer, (2) an 8-inch layer of soil, and (3) the seedling's root system and growing medium (soil) from the container. Once planted, saturate the soil with water. Thereafter, water as often as is required to maintain adequate soil moisture. Caution: Should the ground condition promote waterlogging, refrain from re-watering until the soil appears dry and loose.

Fertilizer

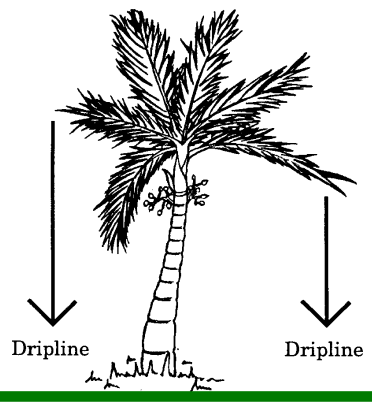
With adequate water, the betel-nut palm can sustain life from the nutrients in the soil it is planted

in. However, providing betel-nut palms with supplemental applications of nutrients or fertilizer on a periodic basis will promote tree growth and increase yield. Healthy plants may avoid pest problems.

A complete fertilizer is best for betel-nut palms. Complete fertilizers contain all three primary elements essential for plant growth which include: Nitrogen (N), Phosphorus (P), and Potassium (K). The letters N-P-K are the chemical symbols of Nitrogen, Phosphorus and Potassium respectively. Choose a fertilizer that is complete in all these primary elements such as the following: 16-16-16 or 10-20-20. The numbers represent the content of N, P, and K respectively on a percentage basis. For example, an 80-pound bag of 10-20-20 fertilizer contains 8 lbs. of N (10% or .10 x 80 lbs.), 16 lbs. of P (20% or .20 x 80 lbs.), and 16 lbs. of K (20% or .20 x 80 lbs.) This means an 80-pound bag of 10-20-20 contains a total of 40 lbs. of Primary Elements (8 lbs. N + 16 lbs. P + 16 lbs. K). The remaining 40 lbs. in the fertilizer bag consist generally of inert materials which help make N, P, and K handle easily and sometimes include other minor but essential elements used by plants.

Fertilizer Application - Application of fertilizer for established betel-nut palms may be done either through topical (soil surface) application or incorporated (worked) into the soil around the drip line of the betel-nut palm. For topical application, a granular form of fertilizer is best used.

Topical application involves the even distribution of fertilizer on the soil surface under the tree and away from the main tree trunk. Preferably, concentrate the application of fertilizer within the circumference of the edge of the leaf canopy or "dripline." It is advisable that the fertilized area be watered thoroughly after application. Note: Fertilizer is best applied in a circular fashion of about a 2-inch band within the dripline area.



Incorporating or working fertilizers into the soil can be accomplished by digging numerous 2-inch wide by 2-inch deep holes about 2 feet apart in the circumference area of the drip-line. Deposit fertilizer, about 1 tablespoon per hole; cover it with soil and water moderately. Incorporating fertilizers into the soil, while requiring more work, makes more efficient use of the fertilizer. This type of fertilizer application provides less chance of fertilizer loss due to evaporation as compared to topical application.

Suggested Fertilizer Rate - Use an application rate of 1/4 to 1/3 pound of complete fertilizer per month per established betel-nut palm.

Fertilizer Use Cautions - Fertilizers contain elements that are intended to be incorporated into the soil or, if water-soluble, they must be diluted in water and applied as a spray or part of irrigation water. Generally, fertilizer used straight out of its container which comes in direct contact with plant parts may burn or destroy plants. In addition, excessive amounts of fertilizers are wasteful and may do more harm to plants. Remember these four rules of thumb about fertilizers:

1. Use the right type of fertilizer.
2. Read the label for proper handling and application method.
3. Do not let fertilizers come in immediate contact with plants.
4. Do not use excessive amounts - a little used more often is better than a lot applied once.

Flower & Fruit Production

Betel-nut palms produce flowers which transform into nuts. The flowers are bunched in a cluster called an inflorescence. A palm can start producing inflorescences anywhere between 4 and 7 years old. The inflorescence appears after the dropping of a frond (leaf). A new inflorescence may appear after each frond

dropping, or at irregular intervals, for an average of three to four inflorescences per year. Also, two to three inflorescences, at different stages of development, can be found on a single palm.

The inflorescence first appears as a sheath-like casing. The sheath will open and drop to expose the flowers within a month from initial appearance. The inflorescence contains two kinds of flowers, male and female. However, a palm's very first inflorescence may contain only male flowers and may produce no nuts.

On the inflorescence, the male flowers are smaller and are located on the outer fringe of the cluster. The larger female flowers are found toward the center of the cluster. Generally, the inflorescence contains a larger number of male than female flowers. Also, the male flowers open first and their sweet scent attracts honey bees and other insects. Several days later, after the last male flower opens, the less fragrant female flowers begin to open. By this time, the attractant of the male flower will have subsided and the presence of bees and any other insects becomes less visible. In fact, these same insects do not frequent the female flowers. Thus the role of these insects as principal pollinators is doubtful. The female flower then depends largely on the wind to transport pollen from the male flowers, either from the inflorescence of the same palm or from a nearby palm.

Once female flowers are pollinated, nut development begins and takes anywhere from six (6) to eight (8) months to reach maturity. An inflorescence can produce as little as a handful to several dozen nuts, depending on (1) the proportion of male to female flowers, (2) pollination rate, (3) pest problems, and (4) nutrient availability to the palm.

Cross-Pollination - When the pollen of a male flower from one palm pollinates the female flower of another betel-nut palm, the end result is called cross-pollination. But regardless of the variety of the palm where the pollen comes from, the female receiving palm will continue to produce nuts that are characteristic of their parental traits, i.e. "Red" or "White" variety. For example, should the male flower pollen of a "White" variety producing palm pollinate the female flower on a "Red" variety producing palm, the female flower will produce a nut characteristic of the "Red" variety. Likewise, should the male flower pollen of a "Red" variety producing palm pollinate the female flower on "White" variety producing palm, the female flower will produce a nut characteristic of the "White" variety.

Effects of Cross-Pollination - If the nut of a cross-pollinated flower is used as a seed, it will produce nuts with a mixture of characteristics of both its male and female parents. This means that using a cross-pollinated nut from a palm known to produce the "Red" variety has the probability, when used as a seed source, of producing nuts characteristic of the "White" variety. Likewise, using a cross-pollinated nut from a palm known to produce the "White" variety has the probability, when used as a seed source, of producing nuts characteristic of the "Red" variety. Of course, among the same group of cross-pollinated nuts, it is possible for certain characteristics of one parent to be dominant over the other from one nut to the other.

Harvesting

Betel-nuts can be harvested one nut at a time off the inflorescence. However, nuts are generally harvested in clusters which involves the removal of the entire inflorescence off the palm. When removing the entire inflorescence, it is best to ensure a clean separation of the inflorescence from the palm.

Immature Stage - Green, immature nuts are picked when the husk and kernel are still succulent. Depending on size and chewing preference, 2- to 3-month old nuts are usually harvested for this characteristic. The soft immature nut and husk are chewed in its entirety, as opposed to the mature nut where the husk is generally removed and the kernel is chewed.

When harvesting the inflorescence of immature nuts, take extra precaution to ensure a clean separation from the palm. Generally, immature inflorescences that are

stripped or pulled off often result in damage to the palm trunk. To avoid damage, use a sharp knife to cut off the base of the inflorescence.

Mature Stage - Mature nuts are usually harvested 8-9 months after flowering. The entire kernel becomes hard and firm as oppose to the soft and jelly-like consistency of the immature kernel. The husk of the mature nut is usually bright yellow or a shade of orange and fibrous in texture. It is not uncommon though to find varying shades of color among nuts on a given inflorescence. To ensure maturity prior to harvesting an entire inflorescence, crack open the lightest colored husk from the among the cluster for visual inspection.

It is advisable that the cluster of mature nuts be harvested rather than to wait for the nuts to naturally fall off. There have been reported cases of soil-inhabiting pests that burrow into the fallen nuts.

Post-Harvest Care of Mature Nuts Kept for Consumption - Often when nuts are stored in a wet or moist condition, the germination process begins to set in and the kernels become cottony in texture. Most consumers of mature nuts find cottony kernels to be less desirable.

For consumption purposes, cottony kernels can be avoided up to a period of 3 months if nuts are stored in dry conditions. Upon harvest, the nuts must be separated from the inflorescence and fully air-dried at room temperature. The nuts should be spread out in a single layer to allow for quick and even drying. The use of a raised screen or net bottom bedding is recommended. Once dried, keep nuts in a cool, shaded area. Soak nuts in water 2-3 days before consumption. The soaking will restore a near harvest-like condition to the kernel.

Betel-Nut Pests

Often plant pests, especially insects, are found feeding on the undersides of the leaves. This portion of the plant is often the coolest and most comfortable spot for pests to establish themselves for feeding purposes. Of course, other parts of the plant can be vulnerable to pest damages including the root system in the soil. It is also possible that other pests, beneficial or otherwise, are attracted by the activity or presence of other pests on the plant.

There are numerous insects and diseases found on the betel-nut palm. Some insects have little effect on the palm, yet some cause significant damage, even destruction, to palms. This section provides a listing of significant insects and diseases that affect betel-nut palms. Some of the insects and diseases identified below are also known pests of other plants.

Insects & Their Damage

New Guinea Sugarcane Weevil - The New Guinea sugarcane weevil lays its egg in the trunk of the palm. When the egg transforms into its larval (worm) stage, it becomes destructive. The larva will tunnel into the crown of the palm tree to feed before it becomes dormant in its pupa (cocoon) stage. The larval stage is the most destructive, causing extensive damage to the trunk and, in many cases, may kill the tree. Severe sugarcane weevil damage is known to kill betel-nut palms by decapitating the top portion of the tree.

Spiraling Whitefly - The spiraling whitefly resembles a tiny, white moth which lays its eggs in a spiral pattern on the underside of the leaves. The immature adults (nymphs) are covered with a waxy, white substance and secrete a honeydew substance. Whitely infestations can reduce tree vigor and the honeydew substance-like buildup will encourage sooty (black) mold fungus development.

Coconut Scale or Transparent Scale - This scale is found on the underside of the palm leaves and its position is marked by a yellow, discolored spot. It appears stationary with a bumpy, scaly-like appearance. The scale is a small, flat insect with a semitransparent or whitish, waxy covering. Heavy scale infestations will stunt new leaf growth and impair flower and nut production. Sooty mold growth is also evident when there is an

abundance of scale outbreaks.

Coconut Hispine Beetle or Brontispa Beetle - The hispine beetle affects young leaflets (unfurled leaves) of the palm. The adult beetle is black, elongated, and flat in appearance with short legs. The larvae are also black and flattened. Both stages are adapted to living between the leaflets of young betel-nut fronds. The adult and larvae eat the surface tissues of young unopened fronds forming irregular brown blotches as the fronds open. The opened frond has a scorched appearance and, depending upon the severity of infestation, the palms may be stunted.

Caseworm - The caseworm appears as a small bag of interwoven decaying leaves and twigs with the larvae encased in the bag. Caseworms are often seen attached underneath the palm fronds and inflorescence. The principal harm of this insect is the feeding injury on the flowers and young nuts. The larvae are known to chew the flowers and the husk of the immature nuts. As the larvae grows, the bag expands. The mature male emerges from the bag as a small moth while the female remains encased throughout her life cycle.

Mealybug - The mealybugs derive their name from the white, waxy secretions that cover their bodies. These mealy-looking bugs are small and tend to clump together. Mealybugs infest all plant parts, especially the undersides of leaves, flowers and developing nuts. Injury to the plant is caused by loss of sap, which results in chlorotic (yellow-appearing) and deformed leaves. In some cases, severe infestations can cause stutning of the plants. Ants are very often seen tending mealybugs for the sweet secretions they produce. The buildup of sweet secretions, in turn, serves as a growing media for the sooty mold fungus.

Diseases & Their Damage

Anthracnose - Anthracnose is caused by the fungus *Colletotrichum acutatum* and affects the flowers, leaves and nuts. The anthracnose begins as yellowish spots or water-soaked areas that enlarge, turn brown, and eventually spread throughout the tree canopy. Infected flowers and young nuts may be killed. When anthracnose attacks mature nuts, the entire husk will develop dark brown, water-soaked areas.

Phomopsis sp. - Phomopsis is a fungus that affects leaves, flowers and nuts at all stages of development. Leaf spots are circular, about one inch in diameter, and brown with the center of the spot becoming black due to the formation of pycnidia (fungus reproductive structures.). Affected leaves turn yellow and die. Spots on infected nuts are similar in appearance.

Sooty mold - Sooty mold is a fungus disease on betel-nut that affects the leaves, flowers and nuts. The honeydew substance-like secretions from such insects like whiteflies, mealybugs, aphids and scales provide a media for the growth of sooty mold. Sooty mold appears as a black, scum-like substance on the surface of leaves, flowers and nuts. Sooty mold may cover the entire leaf canopy and interfere with photosynthesis. In addition, sooty mold may cover the entire husk area of the nut and prevent proper kernel development.

Control of Betel-Nut Pests

Pest Control Limitations - For the betel-nut, as a minor crop, chemical pesticides for control of pests are virtually nonexistent. Compounding the limited number of pesticides available for minor crops are the frequent updates on new requirements imposed on pesticide use. For these reasons, this publication does not contain a list of available chemical pesticides for use on betel-nut. For information on pesticides, including organic forms, for use on betel-nut, contact and extension agent at the Agriculture and Natural Resources unit of the Guam Cooperative Extension, College of Agriculture and Life Sciences, University of Guam.

Minor Crop - In the agriculture industry, the term minor crop is given to agricultural products that are produced in small quantities. In contrast, the term major crop is given to those commodities that are bought and sold on

a large scale in the open market.

Minor Crops and Chemical Pest Control - The laws administered by the Environmental Protection Agency under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) require that all pesticides must be approved and registered for use in any given situation. So before a pesticide can be registered for use on a pest, especially for pest control on edible crops, extensive research studies must be undertaken. The results of the study will determine if a pesticide can be registered for use on a specific crop.

Because of the costly nature of pesticide studies, chemical companies concentrate their efforts on manufacturing pesticides for use on major crops. Therefore, chemical companies direct their studies in areas where the marketing of chemical products is most economically feasible. This is perhaps why most of the pesticides found on the market are registered for use on fruits, vegetables, poultry and livestock grown and raised in significant quantities. Unfortunately, minor crops such as the betel-nut do not always warrant the immediate attention of chemical manufacturers. As a result, very few, if any, pesticides are found registered for use on minor crops.

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The information provided herein is general in nature. Additional information on betel-nut plant care can be obtained by contacting the Guam Cooperative Extension, College of Agriculture and Life Sciences, University of Guam, telephone number 735-2080 or by fax 734-5600.

Disclaimer

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